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ABSTRACT

The computerized group decision making system has potential to become an important part of an organization, but the research done thus far in this area is unfocused, lacks rigor and a theoretical base, and disregards the communication component of the technology except on the most pragmatic, fundamental level. A review of the research makes clear a number of issues in group decision support systems (GDSS) that can be broken down into three categories: independent variables, dependent variables, and paradigm status. No research has yet been done to establish appropriate measures, operational definitions, and research variables. Although the issue of independent variables is briefly addressed in some studies, many of the same issues and variables appear in most of the studies. The dependent variables are rather nebulous and not very well defined. It is also difficult to discern a prevailing framework or paradigm for GDSS research. In the future, researchers should study GDSS as a communication system in order to generate the best design for decision making strategies. Teachers will need to address the challenge to provide students with the skills they will need to cope with the computerized environment. (HOD)

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THE COMPUTER AS COMMUNICATION TOOL: THE CASE OF COMPUTER FACILITATED GROUP DECISION MAKING

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ABSTRACT

The recent growth of computerized communication technology is exciting yet not unproblematic for scholars and teachers of communication. The very nature of the services provided by these new systems removes them from the realm of straight technology into the area of human communication. The study and teaching of communication, then, has gained a new component -- the computer. The purpose of this paper is to present a review of the literature on group decision support systems (a particularly salient technology to speech communication) and the implications of this technology for scholars and teachers of speech communication.

I. INTRODUCTION

The recent growth of computerized communication technology is exciting yet not unproblematic for scholars and teachers of communication. The very nature of the services provided by these systems removes them from the realm of straight technology into the area of human communication. The study of communication, then, has gained a new component -- the computer. The introduction of this new component leads to a number of questions. What impact will this new technology have on the communication environment? How will we, as scholars, study the problem? How will we, as educators, help our students cope with the computerized communication environment? The purpose of this paper is to present a review of the literature on group decision support systems (a particularly salient technology to speech communication), and the implications of this technology for scholars and teachers of communication.

The group decision support system (a "laboratory" designed to facilitate group decision making through computer support, television, and other technical devices) is becoming increasingly popular in today's organization. According to Widener, "this movement [toward computerized group decision making] has been long in coming, and many still feel it has not yet begun. But the evidences are now quite discernible to those who look closely at some of the newer decision oriented systems now being undertaken. . ." (Widener, 1980, p. 1). Although not yet as much a part of the organization as once predicted, experts now agree that we will see an enormous amount of growth in the decision room field in the next two to five years (Huber, 1984; Kraemer & King, 1983). As we will see, we know very little about this potentially powerful communication and decision making tool.

The potential build-up of decision room and group decision support

technology leads us to consider a number of questions about computerized group decision making. Will this technology help us to make "better" group decisions? Is there a significant difference between decisions made in a computer enhanced environment and those made in a non-computer enhanced environment? If there is a significant (and positive) difference in favor of computer enhancement, how might we manipulate the technology to our advantage? Lastly, what kind of research must be conducted now and in the future so that we might maximize the potential of these systems?

The computerized group decision making system has potential to become an important part of the organization (DeSanctis & Gallupe, 1985; Huber, 1984; Kraemer & King, 1983; Widener, 1980); but, as we will see from the review of the literature, the research done thus far in this area is unfocused, lacks rigor and a theoretical base, and disregards the communication component of the technology except on the most pragmatic, fundamental level.

It is well to note that there are many different titles for and definitions of computerized group decision making. These titles include group decision support system (GDSS), computer supported conference room (CSCR), war room, and strategy center (Huber, 1984; Kraemer & King, 1983; Widener, 1980). This paper will use the abbreviation GDSS to represent that which is generally described as "a set of software components, language components, and procedures that support a group of people engaged in a decision-related meeting," (Huber, 1984, p. 1). This definition is purposely broad but appropriate in light of current research which currently is being conducted in many different fields including business, psychology, sociology, speech communication, and telecommunications.

III. LITERATURE REVIEW

This section presents a review of the more significant books and articles which lead up to and represent a unified line of GDSS research. I will begin with a rather general work which has been the basis for a a number of studies in GDSS, and will end with the most comprehensive "state of the art" report available.

Hiltz and Turoff's The Network Nation: Human Communication via Computer was published in 1978. The authors are sociologists and devote much of their research to the "man/machine" interface. Although they do not specifically deal with group face-to-face decision support (indeed, they only deal with communication between the user and the computer or person-computer (P-C) interaction), their research raises questions on the effects of the computer on the communication process, the de-emphasis of personality and interpersonal influences in conferencing, and the role of the computer in future communication and decision making environments. Hiltz and Turoff's research also suggests that through the depersonalization of the machine we are freed from the fear of embarrassment, insecurity, and other influential human factors and may become more active, productive participants in computer-mediated interactions.

Widener (1980) introduces the notion of the "communications center/ briefing room/strategy center" and claims that "[n]o matter what you choose to call these facilities, they are here to stay, and are gaining in popularity every year," (Widener, 1980, p. 16). As a practitioner, Widener's perspective is extremely pragmatic and centers around the use of data processing operations for "heuristic, management oriented applications," (p. 3). Widener points out the areas in which traditional DP/MIS operations have failed, and provides a list of his "critical factors" in GDSS

design. These factors include: proper placement of display screen, proper lighting, flexible seating arrangements, no "loud" art work, no telephones, an "in use" sign for the door of the conference room, and a good support staff. These factors may seem almost intuitive to many, and Widener does not provide a theoretical rationale for his assertions, only his "years of experience."

Gray, et. al. (1981), present one of the most exciting of the articles on actual GDSS implementation. The article chronicles the SMU Decision Room Project, the goal of which was to determine "how to integrate the new information technologies into group decision making by senior executives," (Gray, et. al., 1981, p. 122), and was presented at the First International Conference on Decision Support Systems. The major sections of the paper cover the nature of group decision making in business (a description of its most common characteristics), design concept (a description of the actual decision room), scenario (an appropriate case which might be used in the decision room), initial research program (fundamental issues involved in GDSS), organization of the data spaces, possible educational use of the decision rooms, and concluding remarks. The article is straightforward and almost entirely descriptive. It is interesting to note, however, that the authors' "fundamental issues" are quite similar to Widener's critical factors, but this article goes on to develop different design criteria for specific decision making situations. Again, the authors predict that the decision room will be an important feature in the organization of the future, but they do not offer empirical or theoretical support for these ideas.

Two years later this article was followed by another paper by Gray at the Third International Conference on Decision Support Systems in 1983.

Gray's paper "describes the implementation of this facility and some initial observations based on exercises run with a group of Executive MBA students," (Gray, 1983, p. 135). The cases used in the exercises included various production, financial, organizational development, and material replacement problems. The actual hardware design is described, the participants identified, and each exercise reviewed. The exercises are not "formal experiments" in a traditional sense but provide what Gray refers to as "initial impressions." These impressions are "about how people working in the Decision Room functioned so as to provide a basis for hypotheses that could later be tested in formal experimentation," (p. 138). No hypotheses were presented in this paper, however. These impressions include the ideas that participants were able to try many alternatives and concentrate on promising ones, they had good understanding of "alternative futures" and were able to test them without staff intervention, their small group interactions enhanced their performance, their communication was not strained by the intrusion of technology, and that advanced preparation is critical to the success of an interaction. This article certainly is a promising one; unfortunately, the SMU Decision Room has since been dismantled, and Gray is now at the Claremont Graduate School.

Kull's article on Execucom's Mindsight (1982) is an interesting "hands on" look at a particular GDSS. He begins the article with three now familiar questions: "To what extent will the computer influence or intrude on group thinking? How is the technology likely to be applied? And what problems may be encountered along the way?" (Kull, 1982, p. 70). To answer these questions, Computer Decisions (by which Kull is employed) got together with Execucom of Austin, Texas, to set up a simulation of a "board of directors meeting - like one that might take place in the 1987,"

(p. 70). The participants assembled were actual board members from a number of different companies; the group was ad hoc, an unlikely condition in the "real world" board meeting. The members had very little time to familiarize themselves with Mindsight (the GDSS still was under development at that time), and a "famous business case" (i.e., one they all were familiar with) was used. It was not exactly a rigorous empirical design, but it did yield some interesting results. The article clearly outlines Mindsight's capabilities (straight voting, ranking of issues and options, individual display), as well as the weaknesses and problems encountered during the session. This article also includes an insert highlighting Gray's work at SMU; unfortunately, the "structured experiments" alluded to in the insert have not as yet been conducted or recorded. The article does not conclude without its reservations, but it does acknowledge the future utility of such technology.

Murrell (1983) represents the social psychological side of GDSS. Although not specifically written as a GDSS article, her work does focus on salient issues. Murrell is quite bold in pointing out that "while the ability to introduce structures which enhance human communication processes has been applauded, research to evaluate the impact of various design features is lacking," (Murrell, 1983, p. 63). The author designed an experiment to measure the differences between group and individual decision making in a computer enhanced environment. Murrell found that groups "working together on the arctic survival problem produce a ranking closer to the expert solution than the average of the individual scores," (p. 65); she also found that a "windowed screen" presentation was more effective than a direct message one. Her findings were significant to the .05 level. As this study revolved around a laboratory experiment,

it appears to have rather strong internal validity. Her surrogate for effective decision was well presented but did not yield a good operalization of the variable. In terms of external validity, the simplicity of the design bodes well here, but the use of students and the failure to measure the intrusion effect of the technology causes problems. Unfortunately, Murrell did not allow for a control group that had no computer enhancement. She seems to assume, as others have, that computer enhancement is implicitly better than no enhancement; her goal was to find out which particular enhancements are better than others. Nevertheless, Murrell's article represents one of the few empirical studies available.

Huber's article (1984) deals with three main issues: "system capabilities, system delivery modes, and system design strategies." (p. i). The purpose of the GDSS, according to Huber, "is to increase the effectiveness of decision groups, by facilitating the interactive sharing and use of information among group members and also between the group and the computer" (p. 4). The paper goes on to describe the times when a GDSS is needed and appropriate, how to design such a system, and what sorts of strategies are most often effective. This paper is extremely practitioner-oriented, and lacks behavioral justification for its design strategies. It is quite comprehensive, however, and is useful to a certain extent as it provides specific details about current systems technology.

DeSanctis and Gallupe (1985) do a very nice job assessing the background research in GDSS research as well as provide possible objectives and impacts of future GDSS research. They go beyond Huber's rather nebulous definition of GDSS by breaking the technology down into four separate areas: decision room, local decision network, linked decision rooms, and remote decision networks (1985, pp. 5-7). The authors distinguish

between these four models in terms of proximity of the participants and duration of the decision making session. They also attempt to develop a theoretical rationale for GDSS research, but this attempt is a little outdated in terms of current behavioral research and a bit incomplete. They do, however, bring us a bit closer to a more thorough look at GDSS research.

The Kraemer and King article is the most comprehensive of the articles reviewed in terms of the available technology. It covers the current status of GDSS in the United States and abroad, describes the kinds of GDSS's now in use, the evolution and growth of GDSS, and the likely near-term future of GDSS. They tell us what types of systems are available, how much they cost, and when one would do well to use a GDSS. As the report was prepared for the Department of Information and Computer Science at the University of California-Irvine, its primary focus is technical and does not deal with the behavioral aspects of GDSS.

This brief review of the literature has made clear a number of issues in GDSS research. I would like to break these issues down into three categories: independent variables, dependent variables, and paradigm status; I will discuss each in terms of the research reviewed.

First of all, with the exception of Murrell's article, most of the research was loosely empirical at best. Second, each article offers lots of research issues and implications for future research, but no basic research has yet been done to establish appropriate measures, operational definitions, and research variables. More importantly, implicit in all of these studies is the belief that computer enhanced decision making

environments are necessarily better and provide better decision making climates than those without computers and GDSS's. The Kull article touched briefly on the issue of whether or not GDSS's made for better decisions, but in the end seemed to fall back on the notion that GDSS's are here to stay, so regardless of their consequence we may as well learn to use them to our advantage.

Although the issue of independent variables was briefly addressed in DeSanctis and Gallupe's article, many of the same issues and variables appeared in most of the articles. These included physical design of the GDSS room, hardware and software design, the role of preparation and training in effective GDSS sessions, situational constraints upon the use of the system, and managerial use and involvement with GDSS. These issues certainly are critical to future design and implementation of GDSS's, but it would seem useful to step back and conduct more basic research first (i.e., research to test the underlying assumptions presented here). The Gray and Kull articles offer some extremely useful and intuitive advice, as does the DeSanctis and Gallupe article, but this area of research needs a more adequate blend of theory and practice.

The dependent variables involved in GDSS were also implicit in most of the articles. These variables are, unfortunately, rather nebulous and not very well defined. They include quality of decision, level of participation, quality of participation, productivity, length of discussion, and effectiveness. Except for level of participation, length of discussion, and productivity, the variables are qualitative and ill-defined at this time. Murrell was able to measure quality of decision by comparing her subjects' decisions on the subarctic survival case with

those of the "experts" that designed the case. This is a narrow instance, however, and Murrell provides us with a surrogate for the variable but does not define it as such. Just as the research assumes the beneficial nature of GDSS, it also assumes that these are the variables to be reckoned with but does not tell us how or why.

Overall, it is difficult to discern a prevailing framework or paradigm for GDSS research. Although many of the articles share some issues, GDSS research is pre-paradigmatic (indeed, for the most part it is pre-experimental) and needs to focus more on the theory and possible experimental/empirical research methods. There seems to be agreement on the basic technologies which make up a GDSS (Huber, 1984; Kraemer & King, 1983; DeSanctis and Gallupe, 1985); as researchers, the behavioral aspects (particularly the communication behaviors) become the main object of study.

III. IMPLICATIONS FOR SPEECH COMMUNICATION

Based on the review of literature, there appears to be a number of salient issues involved with this particular technology. For our purpose, these issues can be broken down into two categories, teaching and research. Although GDSS will not be prevalent for another couple of years, these issues are communication focused and may aid in shaping our work in the near future. The research issues will be addressed first to be followed by the teaching issues.

It is clear that the potential success of GDSS technology is closely tied with the human side of the system. More specifically, the human communication behaviors of group participants are critical factors in the success of a GDSS, and we must deal with communication from an observational as well as manipulative perspective. We observe in order to gain a more complete understanding of the process, then manipulate in order to determine optimal design strategies for successful GDSS implementation. In order to accomplish such goals, however, a number of problems must be resolved.

First of all, basic observational research is needed to determine the actual effects of technology on the group environment. Many organizations are building these systems with the hope of improving in-house small group decision making, yet there is no clear cut evidence to support or refute the assumptions underlying this premise. Before we can manipulate these systems to our advantage we must establish what actually is going on in these environments.

Next, we need to operationalize the variables to be studied. As we have seen, the independent variables basically are the same across all of the studies, although empirical/theoretical bases for design strategies have not been established. These variables include decision room hardware and system software components. More work is needed to formalize these.

The dependent variables are less tangible, however, and are almost entirely

communication intensive. For example, variables include quality of decision, quality of interaction, effectiveness of group interaction and level of participant influence. The variables are vague and ill-defined. Work completed thus far has all but ignored prior work done in small group research, as communication theorists we may well provided the needed definitions for future research. More work is needed to narrow the scope of these variables as well as to formalize their definitions so they may be measured adequately.

In light of these variables, we need to determine whether or not GDSS's do indeed contribute to "better decisions" and decision making transactions. If we determine that GDSS's do contribute to better decisions, we need to do further research to determine the best ways to manipulate our independent variables to devise more effective design strategies. If we find that GDSS's do not make a positive contribution to the decision making process, we might then want to determine what aspects of GDSS contribute to this dysfunction and adjust our research accordingly. As communication theorists we should use our skills to provide theoretical frames upon which future research, both practical and academic, may be based.

As educators we are faced with yet another set of considerations, for us GDSS becomes an object of study as well as a teaching tool. We must study computer mediated communication technology in order to teach our students strategies for coping with these environments; we must also study them in order to understand the ways in which we might use these technologies as teaching tools. We will examine GDSS first as an object of study and then as a possible teaching tool.

If the previously cited predictions are correct, in the next five to ten years our students will be entering organizations that will use GDSS as an integral

part of the overall organizational decision making process. The ability to communicate effectively will no longer be limited to people interacting with people but will expand to include the computer as well. The objective of the service courses in professional and small group communication may have to adapt to this change as well. By studying such technologies as GDSS we may establish a better understanding of the technology and the human interaction it mediates. Hopefully we will be able to provide our students with adequate and critical communication skills to meet the challenges created by these systems. Just as speech communication has adapted to trends in society in the past so too must it adjust to life in the computer age.

Another important aspect of GDSS is its potential as a teaching aid. The current technology is prohibitively expensive, but trends seem to indicate that more and more universities and organizations are building decision rooms for research, development, and teaching, and therefore the technology may be more easily accessible in the near future. The possible applications for teaching are exciting and varied.

For example, we know that humans are not necessarily good or systematic decision makers and that trying to teach decision making skills is not always easy, although research suggests that training can be very effective. The GDSS in this instance may be used as an optimizing model to help groups learn how to make better decisions. Once the basic questions have been answered through research we will be free to explore and develop more useful GDSS software applications to help us teach students to improve their small group decision making behaviors.

It is important for us to remember that although GDSS and other technologies have been mostly in the domain of engineers and computer scientists, the human

communication component of these sytems must not be overlooked. The most "elegant" computer system in the world is useless if no one is willing to use it; similarly the most "elegant" GDSS software is useless if it does not help groups tap into optimal strategies for decision making. As researchers we must study GDSS as a communication system in order to generate the best design strategies possible. As teachers we must address the challenge to provide our students with the skills they will need to cope with the computerized environment.

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